

REMARKS

In the Office Action, the Examiner rejected claims 1-14 under 35 U.S.C. § 102(b) as being anticipated by United States Patent No. 6,204,179 (McTeer) and further rejected claims 1-14 under 35 U.S.C. § 103(a) as being unpatentable over McTeer in view of United States Patent No. 6,150,252 (Hsu et al.). The independent claims have been amended to further distinguish the claimed invention from that which is disclosed in the cited references.

Specifically, the independent claims have been amended to specifically claim a permanent interconnect liner layer of aluminum-0.5% copper alloy. The major target of the present invention is to create an additional metal liner between the diffusion barrier (Ta/TaN) and the copper inside the vias and trenches. This liner should be characterized by a good electrical conductivity and at the same time by a good enough resistivity to the electromigration. This liner should survive during the chip lifetime. The present invention proposes aluminum-0.5% copper alloy as the material to use for this liner.

In contrast, McTeer uses a sacrificial Al liner as a wetting underlayer to assist a gap-fill by copper reflow. McTeer needs this Al to lower the Cu reflow temperature (to prevent diffusion barrier material from the chemical erosion). As mentioned in column 18, lines 15-18, "...the aluminum wetting layer is consumed thereby forming a Cu_{sub_n}Al alloy layer wherein n is an integer from about 0.5 to about 4". The Examiner has determined that this means 0.5% copper alloy, however, it means that alloy is from interval of atomic compositions: from 2Al - 1Cu to 1Al - 4Cu, which means an alloy with Cu concentration from 33% to 80%, but not 0.5%. It is clear why McTeer needs such alloys. The melting point will be reduced almost twice when 40-

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50% of Al will be added to Cu (compared with the Cu melting point). In the present invention, this Cu concentration is not acceptable because it will dramatically increase a resistivity of the Al liner and will destroy the purpose of its employment.

With regard to the secondary reference, Hsu et al. does not disclose or suggest a copper fill. In addition to specifically claiming a permanent interconnect liner layer of aluminum-0.5% copper alloy, the independent claims of the present invention specifically claim a copper fill. In contrast, Hsu et al. discloses filling with aluminum (see col. 9, lines 1-10).

Applicant respectfully submits that neither McTeer nor Hsu et al. disclose or suggest providing an aluminum-0.5% copper alloy interconnect liner layer in contact with a copper fill.

In view of the above amendments and remarks, Applicant respectfully submits that the claims are allowable over the prior art of record, and respectfully requests that the application be passed to issuance.

Should the present claims not be deemed adequate to effectively define the patentable subject matter, the Examiner is respectfully urged to call the undersigned attorney of record to discuss the claims in an effort to reach an agreement toward allowance of the present application.

Respectfully submitted,

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